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PATENT SPECIFICATION

DRAWINGS ATTACHED

943.148

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The inventors of this invention in the sense of being the actual devisers thereof within the meaning of Section 16 of the Patents Act 1949 are Maximilian Stap, of Dutch Nationality, of Minervaplein 43, Amsterdam, Holland and Leonardus Arnoldus Nicolaas Bijvoet, of Dutch Nationality, of Waldeck Pyrmontlaan 2, Overveen, Holland.

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COMPLETE SPECIFICATION

Improvements in or relating to Bung-hole Constructions and Method of Making the Same

We, VAN LEER INDUSTRIES LIMITED, a British Company, of 106, Edmund Street, Birmingham 3, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to bung-hole constructions and methods of making the same.

In conventional shipping containers having a sheet metal wall with a bung-hole therein the latter is usually defined by a bung-hole bushing secured to the container wall, a sealing gasket being interposed between said bung-hole bushing and the container wall. These gaskets are usually made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, for instance rubber. When the bung-hole bushing is secured to the container wall the gasket is clamped between the two parts and deformed, and because its material retains its resiliency the gasket will ensure a permanent seal.

Lately, a rising demand has developed for sheet metal containers for the packaging, the storage and the transport of aggressive fluids, solvents, detergents and the like, such as for instance methylene-chloride (CH_2Cl_2), chloroform or trichlorine-methane (CHCl_3) and trichlorine-ethylene (ClHCCl_2).

Some of these chemicals are known, and sometimes actually used, as solvents for rubber. Anyway, they have an unfavourable effect on rubber, and in particular cause rubber to swell phenomenally when coming into contact with it.

This would not present any difficulties if the gasket were completely isolated from the interior of the container so that the fluid packaged therein could not come into direct contact with the rubber gasket, or if the width of the gap between the flange of the bung-hole bushing and the container wall could be kept below a certain limit. However, under normal manufacturing conditions this cannot be ensured, and the result might well be described as a sort of chain reaction. The fluid penetrates through the gap between the bung-hole bushing flange or end and the container wall and comes into contact with the rubber gasket, thereby attacking the material thereof, and making it swell. This results in part of the gasket protruding from the gap thereby increasing the surface area of the gasket which is exposed to the action of the fluid and so on. Thereby, not only leakages are caused but moreover the fluid is vitiated which often cannot be permitted, for instance when the fluid is to be used for pharmaceutical purposes.

There are various materials, particularly thermoplastic materials, known which have a high resistance to one or more of the aggressive fluids here concerned, and the obvious solution of the problem outlined above would be to provide containers which are to be used for such aggressive fluids with sealing gaskets made of one of these materials. However, most if not all of these materials also have "cold flow" or "creep" characteristics, that is that they undergo a permanent deformation or set under continuous pressure. Therefore, they are not suitable for this particular purpose, because after some time the

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sealing effect decreases and finally completely disappears.

It is an object of the present invention to overcome these drawbacks and with this and other objects in view the invention provides a container having a sheet metal wall with a bung-hole therein defined by a bung-hole bushing secured to the container wall, a sealing gasket being interposed between said bung-hole bushing and said container wall, said sealing gasket being made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, and said sealing gasket being separated from the interior of said container by a projecting ring made of a material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene or a similar thermoplastic material.

Thus, initially the protecting ring seals and protects the rubber gasket from the fluid in the container. If, by the cold flow properties of the material of this ring the sealing effect gradually decreases, a gap of extremely small width may be formed; if however, the width of this gap increases to such an extent that fluid particles can penetrate to the gasket, the material of the latter swells, thereby pressing the protecting ring material more tightly into the gap and automatically restoring the sealing effect. Moreover, the protecting ring material prevents the rubber from protruding out of the gap, the more so since it allows only minute quantities of fluid to penetrate to the gasket.

It has further been found that the protecting ring is kept in place even if there is some shift of the bung-hole bushing in relation to the container wall, for instance by temperature differences, mechanical blows or loads on the bung-hole assembly or other causes. If, thereby, the gasket is locally clamped in more tightly it will assume a larger deformation thereby pushing the projecting ring somewhat in front of it, and causing it to seal the gap between the bung-hole bushing flange and the container wall more tightly.

The invention also provides a method of making such a sheet metal container; the method according to the invention comprises the steps of forming a bung hole in the sheet metal container wall, inserting a bung-hole bushing into said bunghole whilst interposing between said bushing and said container wall a sealing gasket made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, and a protecting ring separating said gasket from the interior of said container and being made of a material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene or a similar thermoplastic material, securing said bung-hole bushing to said container wall

whilst compressing said sealing gasket and said protecting ring, and uniting said sheet metal wall with other wall portions to form a container.

In a preferred embodiment of the invention the bung-hole bushing is formed with an annular neck portion and a base portion laterally extending from said neck portion and positioned interiorly of said container, the sealing gasket being positioned in the corner between said neck portion and said base portion and substantially in engagement with both bung-hole bushing portions; the protecting ring is located around the sealing gasket and initially is substantially in engagement with the base portion only.

In a particularly advantageous embodiment of the invention a protecting ring is used which is provided with an annular inwardly projecting membrane extending between said sealing gasket and said base portion. Thereby, centering the protecting ring with respect to the sealing gasket and the neck portion of the bung-hole bushing is greatly facilitated; moreover, the protecting ring is securely held in place before the bung-hole bushing is secured to the container wall by the sealing gasket which lies on top of the annular membrane and which tightly fits about the bung-hole bushing neck portion.

Thus, the gasket and protecting ring can be shipped separately from the bung-hole bushing, since the annular membrane ensures correct positioning of the protecting ring even when unskilled labour is involved. Alternatively, they can be shipped together with the bung-hole bushing, the co-operation of the tightly fitting gasket with the annular membrane of the protecting ring preventing the loss of either part.

Therefore, the present invention also provides an assembly of parts for use in the method according to the invention comprising a bung-hole bushing, a sealing gasket and a protecting ring encircling said sealing gasket.

In an alternative embodiment of the invention said bung-hole bushing is formed with an annular neck portion and a base portion laterally extending from said neck portion and positioned exteriorly of said container, said sealing gasket being positioned in the corner between said neck portion and said base portion and substantially in engagement with both bung-hole bushing portions, and said protecting ring being positioned on said neck portion substantially in axial side-by-side relationship to said sealing gasket.

The invention will now be described more in detail, reference being had to the accompanying drawings showing by way of example only, a preferred embodiment of the invention. In these drawings:

Figure 1 is a vertical axial cross-sectional view of a bung-hole construction according to the invention,

Figure 2 is a similar cross-sectional view of part of said construction on an enlarged scale,

5 Figure 3 is a cross-sectional view on the same scale as Figure 2 showing the different parts before the assembly thereof, and

Figure 4 is a cross-sectional view of a protecting ring in a preferred embodiment,

10 Figure 5 is a vertical axial cross-sectional view similar to that of Figure 1 of an alternative bung-hole construction according to the invention,

Figure 6 is a cross-sectional view of part of this alternative construction on an enlarged scale.

15 Figure 7 is a cross-sectional view on the same scale as Figure 6 showing the different parts of the alternative construction before the assembly thereof, and

20 Figure 8 is a cross-sectional view of the protecting ring used in this embodiment of the invention.

The sheet metal container wall 11 shown in the drawings has a bung-hole defined by a 25 bung-hole bushing 12 secured to said container wall in a manner hereinafter to be described and provided with internal screw threads 13 so as to be capable of receiving a bung or other closure member or dispensing means, such as a valve or cock, provided with external screw threads. However, it should be noted that the invention is not limited to the use of bung-hole bushings having screw threads.

35 The bung-hole bushing 12 is formed with a neck portion 12a inserted into a container wall collar 11a surrounding the bung-hole in the container wall 11, and with a base portion 12b laterally extending from said neck portion and positioned interiorly of the container, (Figures 1 to 3) the neck portion being accommodated in a recessed portion of the container wall 11. The circumferential wall of the recessed portion and of the base portion are preferably non-circular, for instance 45 polygonal, in order to prevent the bung-hole bushing from rotating when a bung or similar closure member is screwed home or is to be unscrewed.

50 Before inserting the bung-hole bushing 12 into the bung-hole a sealing gasket 14 made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, is interposed between the bushing 12 and the container wall 11 on the inner side thereof; as shown in the drawings, and particularly in Figure 3 thereof, the sealing gasket 14 is positioned in the corner between the neck portion 12a 60 and the base portion 12b of the bung-hole bushing, and preferably the rubber gasket is a tight fit about the neck portion 12a in order to prevent the loss of the gasket when bung-hole bushings are shipped separately.

65 Also before inserting the bung-hole bushing

a protecting ring 15 encircling the sealing gasket 14 is provided, said protecting ring being made of a thermoplastic material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene. 70

The bung-hole bushing 12 is secured to the container wall 11, for instance in a conventional way by curling the top edge of the bushing neck portion about the top edge of the container wall collar 11a; thereby, the 75 sealing gasket 14 as well as the protecting ring 15 are deformed and tightly clamped between the container wall and the bushing neck and base portions.

As shown particularly in Figure 2 of the drawing, the sealing gasket 14 is sealed and protected from the fluid in the container by the protecting ring 15, the interior of the container being under the wall 11 in Figures 1-3. When the sealing effect of this ring 85 because of the cold-flow properties of the material thereof gradually decreases small fluid particles may penetrate through the gap 16 and part the protecting ring 15 to the sealing gasket 14; this will cause the gasket to swell so that the protecting ring material is pressed more tightly outwardly towards and eventually into the gap 16, and thus the sealing effect will automatically be restored. Moreover, the 95 protecting ring prevents the sealing gasket from protruding out of the gap and from, for instance, vitiating the fluid in the container, the more so since only minute quantities of fluid can penetrate to the sealing gasket, and hence the swelling effect is also 100 limited.

If, by some cause or other, there is some shift of the bung-hole bushing in relation to the container wall collar, and the space in which the sealing gasket 14 is confined is 105 locally decreased, the gasket will, since rubber is deformable but not compressible, assume a larger deformation in an outward direction thereby pushing the protecting ring in front of it outwardly and thus causing it to seal 110 the gap 16 more tightly.

Inasmuch as the rubber sealing gasket 14 assumes a larger diameter when the parts of the bung-hole construction are assembled to the final position shown in Figures 1 and 2, 115 preferably the inner diameter of the polyethylene protecting ring 15 is chosen somewhat larger than the outer diameter of the sealing gasket in un-stressed condition. This might lead to difficulties in centering the protecting ring, particularly if unskilled labour is employed for securing the bung-hole bushing in the container wall opening; moreover, the protecting ring might get lost during transport. Therefore, preferably, and as 125 shown in the drawings, the protecting ring 15 is provided with an annular inwardly projecting membrane 15a the inner diameter whereof is about equal to or only slightly larger than the outer diameter of the neck 130

portion 12a. In this case of course the protecting ring is mounted first, the membrane ensuring correct centering, and thereafter the sealing gasket tightly fitting about the neck portion is applied so that the annular membrane 15a is confined between the sealing gasket and the bung-hole bushing, base portion. Thereby the assembly of bung-hole bushing, sealing gasket and protecting ring can be shipped in assembled state, the co-operation of the tightly fitting gasket with the annular membrane of the protecting ring preventing the loss of either part.

In the alternative construction shown in Figures 5, 6, 7 and 8 the bung-hole bushing 12 is also formed with a neck portion 12a inserted into the container wall collar 11a, and with a base portion 12b laterally extending from the neck portion. This time, the base portion is positioned exteriorly of the container, the interior of which is again under the container wall 11 in the drawings. Again, the base portion 12b is accommodated in a recessed portion of the container wall 11.

Before inserting the bung-hole bushing into the bung-hole a sealing gasket 14 made of rubber, for instance, is positioned on the neck portion 12a substantially in the corner between the neck portion and the base portion. Inasmuch as in this alternative construction the aggressive fluid may approach the sealing gasket from the other side, the protecting ring 15 is now positioned on the neck portion 12a substantially in side-by-side relationship to the sealing gasket, so that after completion of the bung-hole construction as shown in Figure 5 the sealing gasket is effectively protected by the protecting ring from fluid penetrating past the bead or curl by means of which the bung-hole bushing is secured in the bung-hole and to the collar of the container wall surrounding that hole.

With the construction according to the invention excellent results have been obtained with a protecting ring having a substantially square cross-section and a radial width and an axial height which are about one half of the width and height of the sealing gasket also having a substantially square cross-section, the difference between the inner diameter of the protecting ring and the outer diameter of the sealing gasket being about twice the radial width of the protecting ring, so that the width of the annular gap between the two and that of the protecting rings are about the same. This of course applies to the parts before their assembly.

Although a preferred embodiment of the present invention has been shown and described it is to be understood that it is not intended to limit the invention thereto; on the contrary, various modifications, alterations and additions may be made without departing from the scope of the invention as defined in the appended claims.

For instance, the protecting ring may be made of a material different from a thermoplastic material, such as asbestos, fibre, etc., impregnated or not. In the construction shown in Figures 1—3 the annular membrane may be omitted, or secured to another portion of the protecting ring, for instance at a level somewhere between its upper surface and its under surface.

WHAT WE CLAIM IS:—

1. A container having a sheet metal wall with a bung-hole therein defined by a bung-hole bushing secured to the container wall, a sealing gasket being interposed between said bung-hole bushing and said container wall, said sealing gasket being made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, and said sealing gasket being separated from the interior of said container by a protecting ring made of a material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene or a similar thermoplastic material.
2. A method of making a container having a sheet metal wall with a bung-hole therein defined by a bung-hole bushing, comprising the steps of forming a bung-hole in said sheet metal wall, inserting a bung-hole bushing into said bung-hole whilst interposing between said bushing and said container wall a sealing gasket made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, and a protecting ring separating said gasket from the interior of said container and being made of a material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene or a similar thermoplastic material, securing said bung-hole bushing to said container wall whilst compressing said sealing gasket and said protecting ring, and uniting said sheet metal wall with other wall portions to form a container.
3. A method according to claim 2, in which said bung-hole bushing is formed with an annular neck portion and a base portion laterally extending from said neck portion and positioned interiorly of said container, said sealing gasket being positioned in the corner between said neck portion and said base portion and substantially in engagement with both bung-hole bushing portions, and said protecting ring being located around said sealing gasket and substantially in engagement with said base portion.
4. A method as claimed in claim 3, in which a protecting ring is used provided with an annular inwardly projecting membrane extending between said sealing gasket and said base portion.
5. A method as claimed in claim 2, in which said bung-hole bushing is formed with an annular neck portion and a base portion

- laterally extending from said neck portion and positioned exteriorly of said container, said sealing gasket being positioned in the corner between said neck portion and said base portion and substantially in engagement with both bung-hole bushing portions, and said protecting ring being positioned on said neck portion substantially in axial side-by-side relationship to said sealing gasket.
- 5 6. An assembly of parts for use in the method as claimed in claim 4, comprising a bung-hole bushing formed with an annular neck portion and a base portion laterally extending from said neck portion, a sealing gasket made of a resilient material which substantially retains its resiliency when subjected to continuous pressure, such as rubber, said sealing gasket being located and tightly fitting around said neck portion, and a protecting ring made of a material having a high resistance to aggressive fluids, solvents, detergents and the like, such as polyethylene or a similar thermoplastic material, said protecting ring having an inner diameter which is larger than the outer diameter of said sealing gasket and being provided with an annular inwardly projecting membrane the inner annular edge of which is confined between said sealing gasket and said base portion of said bung-hole bushing.
- 10 7. A container having a bung-hole construction substantially as herein described with reference to the accompanying drawings.
- 15 8. A method of making a container with a bung-hole construction substantially as herein described.
- 20

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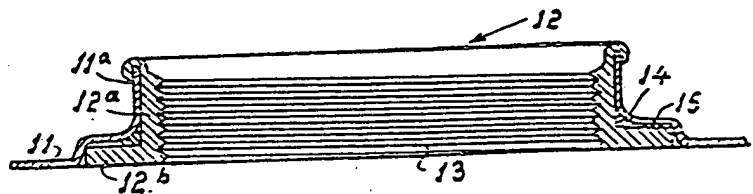


FIG. 1

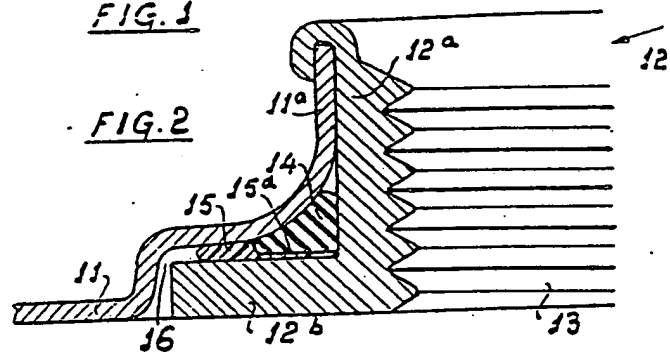


FIG. 2

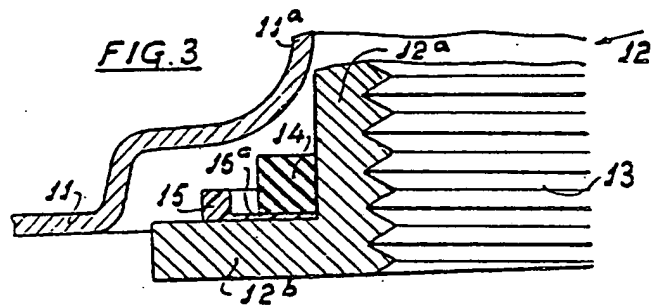


FIG. 3

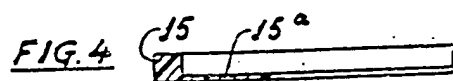


FIG. 4

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COMPLETE SPECIFICATION

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